UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/076,120	02/12/2002	Feng Yang	122-2.1	8897

7590 03/17/2006

Truong Dinh
Dinh & Associates
2506 Ash Street
Palo Alto, CA 94306

EXAMINER	
SHORTLEDGE, THOMAS E	

ART UNIT	PAPER NUMBER
2654	

DATE MAILED: 03/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/076,120	YANG ET AL.	
	Examiner	Art Unit	
	Thomas E. Shortledge	2654	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 July 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) *29-33 and 35* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15, 18-28 and 34* is/are rejected.

7)☒ Claim(s) *16 and 17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 July 2005* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to Remarks filed, 07/14/2005.

2. Claims 1-28 and 34 are pending in the application. Claims 1, 5, 12, 13, 16, 17, 19, 23, 25, 27 and 34 have been amended.

3. The objections to the specification and drawings have been withdrawn in accordance with the applicants' amendments.

4. The objections to claims 23, 25 and 27 have been withdrawn in accordance with the applicants' amendments.

5. Applicant's failure to adequately traverse the examiner's taking of Office Notice in the last Office action is taken as an admission of fact(s) notices (Claim 8).

Election/Restrictions

6. Applicant's election without traverse of claims 1-28 and 34 in the reply filed on 07/14/2005 is acknowledged.

Response to Arguments

7. Applicant's arguments with respect to claims 1-28 and 34 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 1, 19 and 34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

10. The terms "substantial portion" and "a large portion" in claims 1, 19 and 34 is a relative term which renders the claim indefinite. The terms "substantial portion" and "a large portion is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The examiner has interpreted the claims to read "an output signal clean of the undesired component."

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

12. Claims 1, 2, 4-7, 10, 11, 15, 18 and 34 are rejected under 35 U.S.C. 102(e) as being anticipated by Deligne et al.

As to claims 1 and 34, Deligne et al. teach:

a first signal detector configured to provide a first signal comprised of a desired component (speech signal) plus an undesired component (noise), wherein the desired component includes speech (a speech signal with noise received by a microphone, col. 3, lines 9-15);

a second signal detector configured to provide a second signal comprised mostly of an undesired component (a second microphone to receive noise, col. 3, lines 5-8);

a signal processor operatively coupled to the first and second signal detectors and configured to process the first and second signals based on a cancellation technique to remove correlated undesired component and further based on at least one noise suppression technique to remove the uncorrelated undesired component *(using filtering techniques to remove the speech signal from the noise, using separation by decorrelation, once the filter parameters for the filter have been computed, the are stored and later used to remove nuisance noise from the signal, col. 3, lines 33-54)* to provide an output signal have a substantial portion of the desired component and a

large portion of the undesired component removed (providing a signal that has had the nuisance noise removed, providing a "clean signal", col. 3 lines 50-53).

As to claim 2, Deligne et al. teach the first signal detector is a microphone configured to detect speech (a microphone to detect speech, col. 2, line 63 through col. 3, line 8).

As to claim 4, Deligne et al. teach the second signal detector is a senor configured to detect mostly noise (a second microphone to detect ambient noise, col. 3, lines 4-8).

As to claim 5, Deligne et al. teach an adaptive canceller configured to process the first and second signals in accordance with a set of coefficients for the cancellation technique to proved an intermediate signal having a portion of the undesired component in the first signal that is correlated with the undesired component in the second signal removed an to adjust the set of coefficients using the intermediate signal (an adaptive filter technique configured to process the input noise speech and noise source, where filter parameters are determined, and used as an intermediate signal in the noise removal process, Fig. 1, elements 20, 22, 24, 25 and 26).

As to claim 6, Deligne et al. teach the adaptive canceller is implements a normalized least mean square (NLMS) algorithm (using a popular least mean square adaptation or any of its variants, col. 3, lines 40-47).

As to claim 7, Deligne et al. teach the adaptive canceller is implemented in a time domain (col. 3, lines 20-25).

As to claim 10, Deligne et al. teach a noise suppression unit configured to receive and process the first and second signal to suppress the undesired component in the first signal, and to provide the output signal (receiving a speech signal with noise and a noise signal, removing the noise and outputting the clean signal, col. 3, line 1-50).

As to claim 11, Deligne et al. teach the noise suppression unit is configured to suppress the undesired component in the first signal based on a two-channel spectrum modification technique using the first and second signal (the noise suppression unit is able to suppress the noise from the input signal in a multi-channel technique, col. 3, lines 5-19).

As to claim 15, Deligne et al. teach for installation in an automobile (col. 3, lines 1-4).

As to claim 18, Deligne et al. teach the desired component in the first signal is speech (input speech, col. 3, lines 1-8).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deligne et al. as applied to claims 1 and 5 above.

As to claim 3, Deligne et al. do not teach the second signal detector is a sensor configured to detect automobile vibration. However, Deligne et al. teach a microphone array able to detect different ambient noises within an automobile, (col. 2, line 63 through col. 3, line 8). It would have been obvious to one of ordinary skill in the art at the time of the invention that the invention of Deligne et al. would be able to detect automobile vibration since automobile vibration is an ambient noise within an automobile, and Deligne et al. suggest detecting the ambient noises within an automobile (col. 3, lines 1-8).

As to claim 8, Deligne et al. do not teach the adaptive canceller is implemented in a frequency domain. However, the examiner takes Official Notice that it is old and well-known in the art to implement filter in the frequency domain. Therefore, it would have been obvious for one of ordinary skill in the art at the time of invention to have the filter technique of Deligne et al. implemented in the frequency domain, since there is no special advantage claimed for either choice, and either choice should work equally well.

15. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Deligne et al. as applied to claim 1 above, and further in view of Pollak et al. (Noise Suppression System for a Car).

As to claim 12, Deligne et al. do not teach a noise suppression unit configured to suppress the undesired component in the first signal based on a single-channel spectrum modification technique using the first signal.

However, Pollak et al. teach one-channel spectral subtraction method, abstract; noise suppression system for a car, (title).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the system of Deligne et al. with the methods of Pollak et al. because of the robustness, simplicity, and non-musical tone output of the one-channel method, as taught by Pollak et al. (abstract).

16. Claims 9 and 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Deligne et al. as applied to claims 1 and 5 above, and further in view of Ashley (6,453,291).

As to claim 9, Deligne et al. do not teach a voice activity detector configured to receive the intermediate signal from the adaptive canceller and provide a control signal indicative of non-active time periods whereby the desired component is detected to be absent from the intermediate signal.

However, Ashley teaches a Voice Activity Detector to determine whether or not speech is present within the incoming signal, where a noise signal is detected when no speech is present in the signal (col. 1, lines 30-38 and col. 2, lines 9-19).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention to combine the teachings of Deligne et al. with the methods of Ashley to provide an improved apparatus and method for voice activity detection in a noisy environment within a communication system, as taught by Ashley, (col. 1, lines 20-25 and 35-41).

As to claim 13, Deligne et al teach a noise suppression unit configured to suppress residual undesired component in the first signal based (suppression noise within a residual signal, col. 3, lines 40-55).

Deligne et al. do no teach a voice activity detector.

However, Ashley teaches a Voice Activity Detector to determine whether or not speech is present, where only noise is detected when there is no speech in the signal (col. 1, lines 30-38 and col. 2, lines 9-19).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention to combine the teachings of Deligne et al. with the methods of Ashley to provide an improved apparatus and method for voice activity detection in a noisy environment within a communication system, as taught by Ashley, (col. 1, lines 20-25 and 35-41).

17. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Deligne et al. as applied to claim 10 above, and further in view of Meyer et al. (Multi-channel Speech Enhancement In a Car Environment Using Wiener Filtering and Spectral Subtraction).

As to claim 14, Deligne et al. do not teach the noise suppression unit is configured to suppress the undesired component in the first signal in a frequency domain.

However, Meyer et al. teach a speech detector using a Wiener Filter using a FFT, (page 1169).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Deligne et al. with the methods of Meyer et al. to get a improved noise suppression using an algorithm that yields better

results in noise reduction with significantly less distortions and artificial noise than filtering alone, as taught by Meyer et al. (col. 1, page 1167, abstract).

18. Claims 19, 20, 22 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deligne et al. in further view of Ashley.

As to claim 19, Deligne et al. teach:

a first signal detector configured to provide a first signal comprised of a desired component (speech signal) plus an undesired component (noise), wherein the desired component includes speech (a speech signal with noise received by a microphone, col. 3, lines 9-15);

a second signal detector configured to provide a second signal comprised mostly of an undesired component (a second microphone to receive noise, col. 3, lines 5-8);

an adaptive canceller configured to receive and process the first and second signals to remove a portion of the undesired component in the first signal that is correlated with the undesired component in the second signal and to provide an intermediate signal (an adapted filter used to process the first and second signal and also removes a portion of the undesired component, Fig. 1, elements 24 and 25, and col. 3, lines 9-18);

a noise suppression unit configured to receive the intermediate and second signal, to suppress uncorrelated undesired component in the intermediate signal based on a spectrum modification technique, and to provide an output signal having a

substantial portion of the desired component and a large portion of the undesired component removed (using filtering techniques to remove the speech signal from the noise, using separation by decorrelation, once the filter parameters for the filter have been computed, the are stored and later used to remove nuisance noise from the signal, col. 3, lines 33-54 and providing a signal that has had the nuisance noise removed, providing a "clean signal", col. 3 lines 50-53).

Deligne et al. do not teach a voice activity detector configured to receive the intermediate signal and provide a control signal indicative of non-active time periods whereby the desired component is detected to be absent from the intermediate signal.

However, Ashley teaches a Voice Activity Detector to determine whether or not speech is present, where only noise is detected when there is no speech in the signal (col. 1, lines 30-38 and col. 2, lines 9-19).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention to combine the teachings of Deligne et al. with the methods of Ashley to provide an improved apparatus and method for voice activity detection in a noisy environment within a communication system, as taught by Ashley, (col. 1, lines 20-25 and 35-41).

As to claim 20, Deligne et al. teach the adaptive canceller is configured to adaptively cancel the correlated portion of the undesired component based on a linear transfer function (a linear filter, col. 3, lines 20-25).

As to claim 22, Deligne et al. teach the noise suppression unit is configured to suppress the undesired component in the first signal based on a two-channel spectrum modification technique using the first and second signal (the noise suppression unit is able to suppress the noise from the input signal in a multi-channel technique, col. 3, lines 5-19).

As to claim 28, Deligne et al. teach installation in an automobile (col. 3, lines 1-8).

19. Claims 21, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deligne et al in view of Ashley as applied to claim 19 above, and further in view of Boll (Suppression of Acoustic Noise in Speech Using Spectral Subtraction).

As to claim 21, Deligne et al. in view of Ashley do not teach a system wherein the adaptive canceller is configured to adaptively cancel the correlated portion of the undesired component based on a nonlinear transfer function.

However, Boll teaches a method of bias removal and half-wave rectification, (page 114, section F).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention to combine the teachings of Deligne et al. with the methods of Ashley and with the methods of Boll to reduce the noise floor, as taught by Boll (page 115, section F, lines 2-3).

As to claim 24, Deligne et al. in view of Ashley do not teach a noise suppression unit configured to suppress the undesired component in the first signal based on a single-channel spectrum modification technique using the first signal.

However, Pollak et al. teach one-channel spectral subtraction method, abstract; noise suppression system for a car, (title).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the system of Deligne et al. with the teachings of Ashley with the methods of Pollak et al. because of the robustness, simplicity, and non-musical tone output of the one-channel method, as taught by Pollak et al. (abstract).

Claim 25 is rejected for the same reasons as claim 23 above.

20. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Deligne et al. in view of Ashley as applied to claim 22 above, and further in view of Meyer et al.

As to claim 23, Deligne et al. and Ashley do not teach a noise spectrum estimator configured to receive the intermediate and second signals and provide spectrum estimates of the desired component in the intermediate signal and the undesired component in the second signal; a gain calculation unit configured to receive the spectrum estimates and provide a set of gain coefficients, and a multiplier configured to multiply magnitude of a transformed intermediate signal with the set of gain coefficients.

However, Meyer et al. teach:

a noise spectrum estimator (noise floor estimation, page 1169, fig. 3) configured to receive the intermediate and second signals and provide spectrum estimates of the desired component in the intermediate signal (clean speech power spectrum estimated by subtracting current noise power spectrum, page 1169, line 18-19)) and the undesired component in the second signal (current noise power spectrum, page 1169, line 19); and

a gain calculation unit configured to receive the spectrum estimates and provide a set of gain coefficients, and a multiplier configured to multiply magnitude of a transformed intermediate signal with the set of gain coefficients (a frequency domain Wiener filtering necessarily able to determine gain coefficients by which to multiply the FFT magnitude of the noise or voice spectrum page 1169, fig. 3).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention to combine the teachings of Deligne et al. with the methods of Ashley and with the methods of Meyer et al. to get a improved noise suppression using an algorithm that yields better results in noise reduction with significantly less distortions and artificial noise than filtering alone, as taught by Meyer et al. (col. 1, page 1167, abstract).

21. Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deligne et al. in view of Ashley as applied to claim 19 above, and further in view of Meyer et al. in view of Boll.

As to claim 26, Deligne et al. and Ashley do not teach the noise suppression unit is configured to suppress residual undesired component in the first signal based on spectral analysis of the intermediate signal.

However, Meyer et al. teach a spectral subtraction block, speech pause detector, a noise floor estimation block (Fig. 3) where the spectral subtraction technique necessarily works by performing spectral analysis (page 1168).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention to combine the teachings of Deligne et al. with the methods of Ashley and with the methods of Meyer et al. to get a improved noise suppression using an algorithm that yields better results in noise reduction with significantly less distortions and artificial noise than filtering alone, as taught by Meyer et al. (col. 1, page 1167, abstract).

Deligne et al., Ashley, and Meyer et al. do not teach suppression of an undesired residual component in the first signal using the aforementioned intermediate signal.

However, Boll teaches residual noise reduction (residual noise reduction, page 115, column G).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention to combine the teachings of Deligne et al. with the methods of Ashley and Meyer et al. and with the methods of Boll to reduce the noise floor, as taught by Boll (page 115, section F, lines 2-3).

Claim 27 is rejected for the same reason claim 23 is above.

Allowable Subject Matter

22. Claims 16 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

As to claim 16, Deligne et al. (the closest prior art of record) do not teach nor fairly suggest a first noise suppression unit configured to process the first and second signals based n a two-channel spectrum modification technique to suppress the undesired component in the first signal, nor a second noise suppression unit configured to suppress the undesired component in the first signal based on a single-channel spectrum modification technique.

As to claim 17, Deligne et al. do not teach nor fairly suggest a first noise suppression unit configured to process the first and second signals based on a two-channel spectrum modification technique to suppress the undesired component in the first signal, nor a second noise suppression unit configured t suppress residual undesired component in the first signal.

Conclusion

23. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See PTO-892.

24. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas E. Shortledge whose telephone number is (571)272-7612. The examiner can normally be reached on M-F 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (571)272-7602. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TS
3/16/06

RICHEMOND DORVIL
SUPERVISORY PATENT EXAMINER